THE EFFECT OF CONDITIONS OF SCHOOLROOM HEATING AND VENTILATING ON SCHOOLROOM ATTENDANCE[1]

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The following report concerning "The Effect of Conditions of Schoolroom Heating and Ventilating on Schoolroom Attendance" is based almost entirely on the amount of absence from various classrooms during the past school year. The percentages reported are the percentages of absence, so that a high percentage shows a condition of poor attendance. Other things being equal, the attendance in a classroom is a fair index of the health conditions in that room, particularly when the attendance of one room in a building is compared with the attendance in other rooms of the same building or district, of the same or nearly the same grade.

We have in our city about twenty-one so-called portable buildings, which are really one-room school buildings heated and ventilated by means of a jacketed stove, so arranged that cool air from the outside enters the room about the base of this stove, is heated, rises to the upper part of the room, spreads over the room, settles, and is withdrawn from the room by a gravity foul air duct, the room-opening of which is situated at or near the floor level. This is really a gravity system, with the addition that the teachers are at all times allowed to open classroom windows if they wish. As a matter of common observance, most of them do wish to frequently. The conditions in these rooms are practically always good. The "school odor," which is so commonly present in schools ventilated by the usual ventilating system, is practically never present. In these portable rooms, the teachers are almost universally pleased with the conditions. We have frequent requests from grade-school teachers to be transferred to these rooms, but very rarely

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do we find a teacher in one of these rooms desiring to be transferred to a large building.

The writer of this report does not wish to advance any particular theories, but simply wishes to set forth a series of figures based on the actual attendance. Such a report, covering only one year, must necessarily be in the nature of a preliminary one.

The average absence by grades was figured for the lower three grades separately, as most of the portable buildings contain some one of these grades. The average absence for all third grades in the city was 3.64 per cent, for all the second grades was 3.84 per cent, for all the first grades was 4.73 per cent.

Before going into the body of this report, which is mainly upon these portable buildings, I wish to speak of school No. 1. In one room of this building, a fourth-grade room, certain experiments were carried on under the supervision of the engineers, whereby every child was given a supply of air directly in front of his face, which was supposed to be properly humidified and to have the proper amount of oxygen and ozone. The records for the year show that the average absence from this room was 4.29 per cent, whereas the average absence in the ordinary rooms of the fourth and third grades in this building was only 3.09 per cent. So far as I have been able to find out, no records were kept of the gain in weight of the children of this room as compared with the gain in weight of the children of other rooms, so that about the only basis of judgment as to the healthfulness of these rooms depends upon the average amount of absence. The artificial conditions thus obtained seem, therefore, to be detrimental.

As regards the main topic:

School No. 2 had six portables located in the school yard, three fifth grade, two fourth grade, one third grade. The average absence for these portables was 3.71 per cent; the average absence for the whole building, not including these portables, was 3.82 per cent.

School No. 3 had one portable annex, a first-grade room having an average absence of 3.02 per cent, as compared with the average first-grade absence for the whole city of 4.73 per cent.

School No. 4, a group of four isolated portables, had an average

absence of 3.9 per cent. The average absence of the nearest large building, school No. 5, was 5.46 per cent. Taking the comparative figures for these rooms by grades, the third-grade portable rooms had an average absence of 3.73 per cent, while the third-grade absence in the large building was 5.7 per cent; the second-grade absence in the portables was 2.68 per cent, in the large building it was 5.15 per cent; the first-grade absence in the portables was 5.55 per cent, in the large building it was 5.72 per cent. These figures are universally in favor of the portable buildings; moreover, many of these children had a long distance to travel over streets lacking sidewalks and proper breaking out in snow time, so that the large amount of absence in the first grade, which is in excess of the average for the city, is to be expected.

School No. 6 was a group of two portables in the same school district, even more inaccessible than the above group. Its second-grade absence was 5.26 per cent as compared with 5.15 per cent in the large building, and its first-grade absence was 5.66 per cent as compared with 5.72 per cent in the large building.

School No. 7 had two portables adjacent to the building, containing third and fifth grades. Their average absence was 4.05 per cent, as compared with the average absence for the whole building of 3.75 per cent. These seem to be the only rooms in the whole group of portables, having access to a warmed and proper toilet, which have an absence in excess of that for the nearest large building. The cause for this I have been unable to discover.

School No. 8, a single isolated portable of the first grade, shows an average absence of 5.08 per cent as compared with the absence for the nearest large building in the first grade of 4.39 per cent. Here the children were obliged to use an unheated, outhouse toilet, which undoubtedly accounts to some extent for the large percentage of absence.

School No. 9, a group of three portables containing from the first to the fourth grade, had an average absence for the first grade of 4.01 per cent, as contrasted with the 4.73 per cent for all the first grades of the city. The average for all three of these portables was 3.12 per cent. The average absence for the nearest large building for the lower three grades was 3.15 per cent.

School No. 10 was a group of four portables in a very isolated region lacking sidewalks and proper snow breaking, containing first and second grades. The average absence was 5.53 per cent. This apparently high average is undoubtedly due to conditions outside the classroom, as the parents objected very strongly to the outdoor toilets which were necessary here. This undoubtedly forced up the percentage of absence.

School No. 11, a group of two portables in an isolated region, contained first and second grades. The average absence for the group was 4.10 per cent. The nearest big building had an average absence in its first and second grades of 4.33 per cent, while the absence for the first and second grades of the whole city was 4.32 per cent.

School No. 12 had one portable, a third grade, in the school yard. This is a Jewish district, and the percentage of absence is very high, owing to holidays and other things over which school conditions have little control. The average absence for this particular room, however, was 6.75 per cent; for all the third-grade rooms in this building it was 7.97 per cent; for all the grades in the building it was 8.64 per cent.

In summarizing, we find that the figures are in favor of portable buildings in every case, except at schools Nos. 7, 8, and 10. The cause of the poor showing of the latter two has been discussed. It may be said that other conditions have caused this favorable result in attendance. This might be if only one or two of these portables were considered, but when the results are so markedly in their favor throughout the city, it seems fair to assume that there is something in the buildings themselves that makes their conditions more healthful, and the only condition in these portable buildings that varies from those in the large buildings is the method of heating and ventilating.

Whether this improved condition is due to the jacketed stove or to the benefit of opening the windows at any time, it is hard to say. My personal belief is that it is very largely due to the latter.

In addition to these portable buildings handled on a gravity jacketed-stove system, we carried on in our schools three open-window classes. In these rooms a whole grade of children is placed

in a room whose windows are kept open, there being put in the lower sash a cheesecloth screen to prevent direct draft, and the temperature of the room is maintained at about 55°. The children are allowed to wear extra wraps if they desire, but they are given no extra nourishment, nor is the routine of the class in any way changed. They are not selected in any way whatsoever, except that we obtain the consent of the parents before putting a child into this room. We simply say to the parents of the children in a certain room in the building, "Are you willing that your child shall enter a room similar to the above?" Practically all of them are, and we then open the windows and put in a cheesecloth screen.

In school No. 13, the absence for this open-window class, which was started about February 1, varied as follows: From November 1 to February 1, when the room was run as an ordinary classroom on a supposedly modern, fan plenum system, the average absence was 5.3 per cent. On February 1, the windows were opened and cheesecloth screens installed. The average absence from February 1 to May 1 dropped 3 per cent. The teacher of this class in a recent letter states that "the establishment of this room was highly satisfactory and beneficial in many ways. . . . . We had, throughout the remainder of the winter, the best attendance I have ever had in an entering room. The air was at all times fresh and invigorating, and we are hoping to be allowed the privilege of continuing its use next year." During this time, February 1 to May 1, the average absence of the other first-grade rooms in this same building was 5.3 per cent, which is considerably above the average for the city.

Another of these open-window rooms, a fourth-grade room, was opened about February 1 in school No. 14. The average absence in this room from September 1 to February 1 was 2.37 per cent. The average absence in the room from February 1 to May 1 was 2.88 per cent, an increase of 0.5 per cent. In the other fourth-grade rooms in this building, the average absence from September 1 to February 1 was 5.11 per cent, and from February 1 to May 1 was 6.21 per cent, an increase of over 1 per cent. All the third-grade rooms in this building from February 1 to May 1 had an average absence of 4.28 per cent, and the average absence for the whole building during the time was 3.66 per cent.

In school No. 15 one of these open-window rooms was opened a year ago last March. Its effect was so pleasing that it was continued during the whole of the school year just passed. Owing to an epidemic of measles, the average absence was high, 4.01 per cent, but even this is considerably below the 4.73 per cent, which is the average for all first-grade rooms in the city. These children were kept in the room throughout the year. Their weights were taken on November 1, January 1, and May 1. For purposes of comparison, the weights were taken in two other first-grade rooms in the same building. The children in these latter rooms made an average gain of 1.45 pounds; the children in the open-window room made an average gain of 1.85 pounds, which is 27 per cent more gain than was made by the children in the ordinary first-grade rooms.

We have known for some years that children put in open-air classrooms and given extra rest and diet, as has been done for tubercular and sick children, will improve remarkably in their general condition and make marvelous gains in health. During eighteen weeks in our open-air school in Minneapolis, the children made an average gain of 3.3 pounds; two of them gained over 9 pounds; one gained 6.6 pounds and made a double promotion in that time. We have not known, however, whether this increase in weight was due to the type of curriculum, to the rest, to the open air, to the increased diet, or to all these combined. It seems fair to assume, however, from these comparative weights, that a very large proportion of the gain is due to nothing but unadulterated, fresh air, which is neither baked nor stewed.

Some things are worthy of further study. (1) Will these conditions of better attendance in classrooms heated by jacketed stoves, where the teachers have the privilege of opening the windows, continue through a series of years? (2) this we purpose to examine into more carefully during the coming school year: Does the gain in weight of the children in this type of schoolroom compare favorably with the gain in weight of children of like grade and circumstances, in ordinary schoolrooms ventilated by the fan system? We have seen remarkable gains in weight in open-air schools and our recent work shows very favorable extra gain in open-window classes.